

# Newsletter 39

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On-Site Connection with RaZON<sup>+</sup>  
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## Contact

If you have a news item for the newsletter or want to share your experiences with Kipp & Zonen applications and contribute to our next issues, please e-mail the editor: [kelly.dalu@kippzonen.com](mailto:kelly.dalu@kippzonen.com)

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# So... When will it Break? Hunting Down the Oldest Kipp & Zonen Pyranometer

Do you ever wonder how long your most appreciated products will work after the warranty period is over? In some cases you might want even your favourite product to eventually break down, so that you have an excuse to catch up on the latest gadgets! Old technology can slow you down in the fast pace of everyday life, or limit your enjoyment of what is available.

In business, however, the opposite is often true. Some equipment should just work perfectly every time, because you rely on it every day. It just should not fail and help you to run your business for as long as possible. If the mean time between failures (MTBF) is at least a 100 years you will never be bothered by a failure, and have the best investment protection, during your life-time.

Very few products are known to work reliably for 100 years, but recently I ran into a Kipp & Zonen CM11 pyranometer manufactured in 1984 and it still works as would be expected.

I took this picture during my visit to the National Renewable Energy Laboratory institute in Colorado. This CM11 has been measuring solar radiation for 32 years and is still going strong every day. I started to wonder if even older, operational models could be tracked down. We know that the first commercial Kipp & Zonen pyranometers were manufactured in 1924 and, if properly calibrated, they could remain 100% functional. Will you help us to get as close as we can to this original instrument?

Each pyranometer is equipped with a label stating its manufacturing date and when you send your picture over we will post it on-line. It would be great if the image also reflects its circumstances, so that we jointly create an overview of the uses of this special product since its origins in 1924.

Check what instruments you have and watch out for pyranometer hunters in your backyard! The picture counts, and we will gladly invite the winner to the Meteorological Technology World Expo 2017 in Amsterdam and to visit us in Delft. Each entry will be rewarded with a Kipp & Zonen goodie bag.

Looking forward to receiving your pictures on Twitter, Facebook and Instagram using [#pyranometerhunt](https://twitter.com/pyranometerhunt) or go to [www.kippzonen.com/pyranometerhunt](http://www.kippzonen.com/pyranometerhunt)



Erik Valks  
CEO Kipp & Zonen

# RaZON<sup>+</sup> Fully Tested and Ready To Go

The first RaZON<sup>+</sup> systems have left the factory in Delft, the Netherlands, to provide irradiance measurements to customers in the meteorology, solar energy and industrial markets. An important part of the development trajectory to get the RaZON<sup>+</sup> ready for customers was testing. It started with the first prototypes and the separate components, followed by continuous outdoor testing of the full system on our own roof top and, at a later stage, the important CE tests to get it ready to market.



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## Comparison of the RaZON<sup>+</sup> performance

Alongside the outdoor tests at our own facility we had several other locations for testing. We can't disclose all of them but we did cover a wide reach over the globe. One site is also in the Netherlands, but at an independent location, where R&D have tested the RaZON<sup>+</sup> for over 9 months comparing it to a 'BSRN-type' station, built up from a 2AP sun tracker and a CHP1 pyrheliometer and a CMP21 pyranometer.

This site also provided measurements with competitive instruments and the favourable results were presented at the WMO CIMO-TECO meeting in Madrid as well as the Annual EMS Meeting in Trieste, Italy in September 2016.

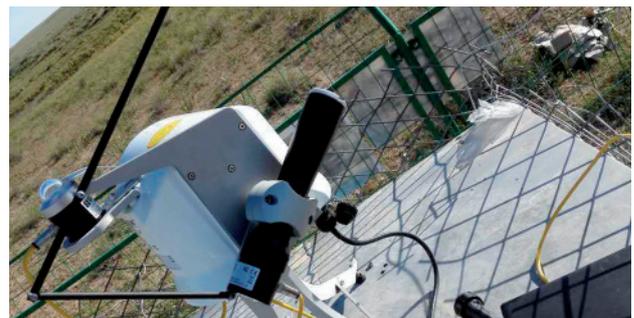
## Tested during the NPC

Kipp & Zonen always participates in the National Pyrheliometer Comparison (NPC) hosted by the National Renewable Energy Laboratory (NREL) in Golden, Colorado, USA with our reference CHP1 and SHP1 pyrheliometers and PM06 Absolute Cavity Radiometer. This was the perfect opportunity to do some final tests with the RaZON<sup>+</sup> and compare it to other absolute cavities

(the world standard for direct solar irradiance measurements). Some practical setup inconveniences were found and corrected.

## Perfect solution for solar prospecting

Another important test location is in Yanchi, in the Ningxia province of China. A prototype has been thoroughly tested by a one of the 5 largest electricity companies of the country. They find in RaZON<sup>+</sup> the perfect solution for prospecting for new solar energy sites.



Keep an eye on our website for further updates and the latest news about RaZON<sup>+</sup> ■

Passion for Precision

# Leading PV in Datong, Shanxi with 14 Solar Monitoring Stations

Last year, China's National Energy Administration (NEA) announced a total PV installation target of 18.1GW for 2016, within which 12.6 GW are for standard types of PV installations, including both ground-mounted PV and distributed PV projects. The additional 5.5 GW are for demonstration projects within the PV Leader Program. The first demonstration projects have been built in Datong and are all monitored with Kipp & Zonen Solar Monitoring Stations.



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## The PV Leader Program

The 'PV Leader Program' was launched in 2015 by the NEA to promote manufacture and use of the latest technologies in solar energy PV modules. Among the various technical parameters the modules must meet is that the conversion efficiency of polycrystalline and monocrystalline modules must exceed 16.5% and 17%, respectively.

For projects that are successfully enrolled in the PV Leader program, NEA has assigned a third-party organization for monitoring and evaluating the entire process, particularly at the time of project acceptance; checking whether the committed target is achieved or not, and announcing the result of evaluation after the plant has been running for one year.

### Datong projects, from coal to solar

The technology demonstration for the PV Leader Program has been developed around Datong City in Shanxi province, Northern China, on a former coal-mining site. This resulted in 13 PV plants, each with a capacity between 50 MW and 100 MW. Once fully operational, they are expected to generate 1.5 TWh of electricity per year, enough to save 480,000 tonnes of standard coal annually.

### Importance of Solar Monitoring

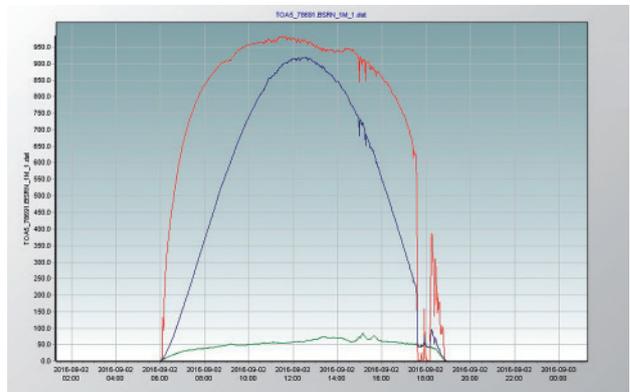
The evaluation of the performance ratio (PR) of each plant is one of the most important indicators and, therefore, solar monitoring data of the sites play an extremely important role. Power China and Beijing Solar & Sky Technology Limited carefully selected suppliers and equipment to provide all 13 of the generating PV plants in Datong, and a central reference site, with an objective and very reliable solar monitoring system.

### Irradiance measurement equipment

At each site an identical solar monitoring station has been installed with some of the best instruments available. The basis of the station is a Kipp & Zonen SOLYS 2 sun tracker with sun sensor for active tracking and equipped with the CHP1 pyrhelimeter and two CMP11 or CMP10 pyranometers.

The whole system is built around the sun tracker and a data logger, with measurement of direct normal irradiance (DNI), diffuse horizontal irradiance (DHI) and global horizontal

irradiance (GHI). At the same time other parameters, such as ambient temperature and humidity, tilted global (plane of array, POA) irradiance, air pressure and precipitation, are also measured by individual sensors. All the data will be checked and analysed using dedicated, user-friendly graphics based software.



DNI (red), GHI (blue) and DHI (green) in Datong

### Successful installation by Power China and Beijing Solar & Sky

It took one and half months for the commissioning work by Power China and Beijing Solar & Sky, including processes of micro-site prospecting and installing the whole 14 systems (one reference station and one on each of the 13 PV plants). Now the project can rely on the quality of Kipp & Zonen solar monitoring products to maximize the efficiency of the energy yield ■



# Novel Estimation of Albedo Using a Drone Pyranometer

*By Charlotte Levy, PhD Student - Goodale & Fahey Labs, Cornell University and Martin LaChance, UAV Imaging Services - Understanding global climate change is a complex process, because small variations in hard to measure variables can turn into major impacts on the global scale. Albedo is a measure of the reflectiveness of a surface. When a surface reflects solar energy, rather than absorbing it as heat, it can result in major cooling both locally and globally.*

Think of the difference between a summer ride in a white car versus a black one. Energy reflected at the surface never has the chance to heat the car's interior. Albedo can vary greatly across surfaces (think of a snowy field or a forested landscape), resulting in climatically significant differences in radiation balance.

## Limited resolution of available albedo data

Studies of global patterns in albedo and land use have generally relied on estimates from broad-band satellite albedo products. However, the most commonly used albedo datasets, the MODIS Bidirectional Reflectance Distribution Function (BRDF), Nadir BRDF-Adjusted Reflectance (NBAR), and albedo products (MCD43) have a 500 m spatial resolution limit, despite the stated need of the ecological community for a product with finer resolution.

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Attempts to develop more comprehensive estimates of albedo have taken many forms and have their own limitations. Fixed

towers at sites across the country have permitted fine-scale quantification of albedo over time, but have tiny footprints and may not accurately represent variation across larger parcels.

## New method using drones to measure albedo

We have developed a novel method of estimating albedo that increases both the flexibility and affordability of measurements using lightweight, low altitude unmanned aerial vehicles (UAVs), also known as drones. As the technology has developed and federal regulations on use have relaxed, UAVs have been increasingly looked to as a compromise between coarse resolution satellite estimates and site-specific point measurements on the ground. Recent adjustments to FAA regulations have made UAV technology more accessible than ever, and it now presents a viable tool for albedo estimation.

## The measurement equipment

Measurements of short-wave broadband albedo were collected



using Kipp & Zonen CMP6 and CMP3 pyranometers. The incoming global short-wave radiation was measured by the CMP6, mounted at the top of a 9 m telescopic mast and recorded by a Kipp & Zonen METEON data logger. The downward facing CMP3 was secured to the underside of a custom-made UAV, levelled by a motorized gimble, and the data recorded by another METEON.

The mast holding the upward-facing CMP6 pyranometer was placed at the take-off location, approximately 200 m from the final measurement point of the downward-facing CMP3, held by the drone at 120 m above the ground. Albedo was calculated as the ratio between the thirty-second averages of the incoming and reflected radiation measurements by the two pyranometers.

The location was a research site in the State University of New York's Heiberg Memorial Forest, near the town of Tully. The drone made a number of flights on 27<sup>th</sup> July 2016 of approximately twelve minutes duration. Five flights, spaced around solar noon (13:11), saw the drone at the assigned latitude and longitude and at the assigned height of 120 m. Observations having interfering cloud cover, based both on local observation and on total incoming solar radiation values being below the selected threshold of  $750 \text{ W/m}^2$ , were removed.

#### **The first test with a drone is promising**

The flights demonstrated that the drone-mounted pyranometer was capable of taking consistent measurements of reflected solar radiation, with the resulting albedo values in keeping with those of literature for similar forest stands. Albedo measurements by drone have not, to the best of our knowledge, previously been carried out successfully; yet they offer an important opportunity to make flexible measurements over a wide spatial range.

While towers are limited in their maximum viewing area, require extensive infrastructure and are constrained to single geographic points, drone measurements might allow detailed characterization of albedo over a wide range of surface types that could be used to validate satellite estimates or to characterize conditions that satellite estimates do not sufficiently capture; such as temporary canopy snow cover, or albedo differences across biomass crop stands.

Visit [www.uavimagingservices.com](http://www.uavimagingservices.com) and the research site at [www.esf.edu/campuses/heiberg](http://www.esf.edu/campuses/heiberg) to find out more ■



# Welcome In Situ of Sweden

Kipp & Zonen is delighted to welcome a new distributor to our global network of representatives. In Situ Instrument AB is located in the renowned Wij Gardens, near the town of Ockelbo, in beautiful central Sweden; surrounded by forests, lakes and countryside. In Situ has been working with measurement techniques in meteorology, hydrology, plant physiology and geology for over 30 years.



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“In Situ means on location, which implies that our measuring systems are not only accurate, but also adapted to varying and challenging environments where different types of processes take place.” says Björn Östberg, CEO of In Situ since 2010.

“As a supplier of high quality measurement solutions we are proud and excited over the partnership with such a reputable company as Kipp & Zonen, and we are convinced that this will help us provide even better customer solutions in the future. In connection to this we are also happy to welcome a new member of the In Situ-team, Ulf Mäkitalo. Ulf has been working for the previous distributor in Sweden, Toragon, and has many years’ experience with Kipp & Zonen products.

However, our company In Situ already has a lot of experience with Kipp & Zonen products. For example, for the Integrated Carbon Observation System (ICOS) in Sweden we developed and installed the research infrastructure at six sites. ICOS aims at quantifying and understanding the greenhouse gas balance of the European continent. Measurement of radiation components was one of the requirements for every site and we installed Kipp & Zonen radiometers and accessories (CNR4 net radiometer, CMP21 pyranometer with CVF3 ventilation unit) at all locations.



Some are mounted on tripods at artic wetlands sites, others are on 150 m high towers over boreal forest ecosystems.”

You can find out about ICOS Sweden at [www.icos-sweden.se](http://www.icos-sweden.se)

Contact details of In Situ can be found in the ‘Local Distributors’ function on our website at [www.kippzonen.com](http://www.kippzonen.com), select Sweden as your country and click on ‘search distributor’.

For more information about the company and the Wij Gardens please visit [www.insitu.se](http://www.insitu.se) and [www.wij.se](http://www.wij.se) ■



# On-Site Connection with RaZON<sup>+</sup>

Do you want an on-site check of solar irradiance data and to see if your solar monitoring system is working properly? With the new RaZON<sup>+</sup> you can connect directly on the spot. Whether you have your smartphone with you, a tablet or a laptop, just connect by the accessory Wi-Fi adapter to find the RaZON<sup>+</sup> and you will get an overview of the status and real-time solar radiation data through a web interface.



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This is one of the key features of the new RaZON<sup>+</sup> ALL-IN-ONE Solar Monitoring System that responds to customer feedback. A separate data logger and readout is no longer needed to check real-time measurements; simply use your mobile device to graphically review the direct, diffuse and global irradiance coming from the Sun.

After you have positioned the RaZON<sup>+</sup> you can check the status of the complete system. Is there a good GPS signal? Is the pyranometer working? You can even fine-tune the alignment to make sure that the pyrheliometer is pointing accurately at the Sun to measure the direct irradiance.

To see it working in practice, go to our YouTube channel to view the video at [www.youtube.com/kipzonen](http://www.youtube.com/kipzonen).



Keep an eye out for more videos about the many key features of the most affordable solar monitoring station available ■

Passion for Precision

# Local Pyranometer Calibrations in the UK & Ireland

Kipp & Zonen recently installed an automated calibration facility at our distributor Equinox Instruments Ltd. in Lincoln, UK. Our pyranometer users in the UK and Ireland can now benefit from calibrations to Kipp & Zonen factory standards with faster turnaround times.



Mathew Redgrave

Peter Redgrave, director and owner of Equinox Instruments: “The UK and Ireland was a booming pyranometer market for the past several years due to high investment in a large number of utility-scale solar energy parks. Now the time has come to re-calibrate those pyranometers and I’m happy that we can now do this at our office to the production level standards of Kipp & Zonen. Our customers benefit from the same high quality, but with reduced shipping costs and shorter measurement downtime.”

“We were trained extensively by Kipp & Zonen specialists to completely understand the calibration procedures and equipment. We had to prepare a special non-reflective and air-conditioned room for the facility to create the required controlled environment for calibrations”.

## Local calibrations, globally supported and monitored

All local Kipp & Zonen automatic calibration facilities provide the same high quality as at the factory. The facility at Equinox Instruments is identical in operation to the existing facilities at the Kipp & Zonen offices in the USA, Singapore and France. The calibration software and server in Delft (the Netherlands) manages the entire calibration process remotely and stores all the data and records, providing consistency and preventing operator mistakes.

The facilities are fully supported by the Customer Services and Research & Development departments of Kipp & Zonen. The support team remotely monitors calibration performance, and audits all calibration facilities to verify the procedures and technical systems.

## Passion for Precision

Passion for Precision is key to Kipp & Zonen and our pyranometers are recognized as the best and most reliable

solar radiation measurement instruments. However, some maintenance is required; primarily cleaning the dome and the replacement of desiccant in some models. Recalibration every two years is strongly recommended to maintain optimum measurement accuracy.

Pyranometers are calibrated according to the ISO 9847:1992 standard, which refers to ‘the Kipp & Zonen device and procedure’. The sensitivity of the test pyranometer is determined by comparing it to a reference instrument of the same type under stable conditions. Calibrations are traceable through the reference instruments to the World Radiometric Reference in Davos, Switzerland.

All instrument calibration information and history is logged in a central database and quality checked. Sensitivity changes can be monitored and Kipp & Zonen pyranometers are proven to be very stable with time.

Peter Redgrave shares this Passion for Precision, “It is a great pleasure for me to be able to serve my customers locally to Kipp & Zonen standards. I’m proud to have the ‘Kipp & Zonen Approved Calibration Facility’ stamp and certificate on my website”.

## Equinox Instruments as a premium partner

Equinox and Kipp & Zonen have a special, long lasting relationship. The company grew out of the former Kipp & Zonen UK office and was founded by Peter Redgrave in 2005 to provide measurement solutions.

Equinox is the exclusive distributor of the Kipp & Zonen portfolio in the UK and Ireland and has now transformed into an added value Kipp & Zonen partner with the addition of local services for calibrations ■

For local calibrations of Kipp & Zonen pyranometers in the UK and Ireland please contact Equinox Instruments Ltd. at +44 1522 695403 or [sales@equinoxinstruments.co.uk](mailto:sales@equinoxinstruments.co.uk) [www.equinoxinstruments.co.uk](http://www.equinoxinstruments.co.uk)

# A growing team

We are happy to announce the expansion of our team with 3 new colleagues. Not only do we have a new colleague at the head office in the Netherlands, but we have also strengthened our International sales team. Keith Gossman is our new sales office director for North America, Leo Teng brings technical support to our partners and customers in China and Martijn van Sebille is the new coordinator of our Brewer department. Please allow them to introduce themselves.



## Keith Gossman

“I have recently joined the Kipp & Zonen team as the General Manager for our US business. My focus is to provide excellent support to our existing customers, while also leveraging my industry experience to educate new customers about our best-in-class product line. I look forward to meeting our customers and partners at AMS in Seattle.

My strong commercial background combined with an emphasis on operations are talents that I bring to Kipp & Zonen. I have more than a decade of experience in the global renewable energy market, and have led solar power teams that have excelled in sales, commercial operations, product management, and project development. In total, I have been part of teams that have executed more than 25GW of successful renewable energy projects.”



## Leo Teng

“I’m the new Technical Service & Sales Manager for China and my main focus will be to provide technical support to our partners and customers for the region. I have been a technical engineer more than 15 years and worked for Radio Holland, Northrop Grumman Sperry Marine and Interschalt. My major is marine technology, such as GPS, RADAR, GYRO etc. Now I join the Kipp & Zonen team to further develop Kipp & Zonen’s leading role in the growing Chinese market and work together with Robin.”

## Martijn van Sebille

“I am very happy to join Kipp & Zonen in the position of Coordinator and Product Engineer within the Atmospheric Science Department, where I will be planning the Brewer business but also assembling and testing Brewer spectrophotometers according to established operating procedures and guidelines. Furthermore, I will be providing customer training as well as product-specific technical support, in order to ensure the instruments’ continued technical reliability in the field.



For the last four years I have worked on a PhD thesis on novel materials for the next generation solar cells at the Delft University of Technology, which I will be defending in the beginning of 2017. After working on a very fundamental subject for the last few years I am looking forward to applying my knowledge and expertise in a more substantial manner and to work on a tangible and technologically world-class product.

And what a coincidence: I’m a Brewer engineer during the work week and a Beer Brewer at the weekends! I recently started to brew my own beer, next to working in my vegetable garden” ■

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## Fairs & Events

World Future Energy Summit (WFES) • Abu Dhabi	16 - 19 January
97 <sup>th</sup> AMS Annual Meeting • Seattle • WA • USA	22 - 26 January
PV Expo • Tokyo • Japan	01 - 03 March
Renewable Energy France Expo • Lyon • France	08 - 10 March
InterMET Asia • Singapore	21 - 22 March
Solar Asset Management North America • San Francisco	28 - 29 March

Passion for Precision

# Passion for Precision

Kipp & Zonen is the leading company in measuring solar radiation and atmospheric properties. Our passion for precision has led to the development of a large range of high quality instruments, from all weather radiometers to complete measurement systems.

We promise our customers guaranteed performance and quality in; Meteorology, Climatology, Hydrology, Industry, Renewable Energy, Agriculture and Public Health.

We hope you will join our passion for precision.

## HEAD OFFICE

### **Kipp & Zonen B.V.**

Delftechpark 36, 2628 XH Delft  
P.O. Box 507, 2600 AM Delft  
The Netherlands

+31 15 2755 210  
info@kippzonen.com  
www.kippzonen.com

## SALES OFFICES

### **Kipp & Zonen France S.A.R.L.**

88 Avenue de l'Europe  
77184 Emerainville  
France

T: +33 1 64 02 50 28  
F: +33 1 64 02 50 29  
kipp.france@kippzonen.com

### **Kipp & Zonen Asia Pacific Pte. Ltd.**

10 Ubi Crescent Lobby E  
#02-93 Ubi Techpark  
Singapore 408564

T: +65 6748 4700  
F: +65 6748 6098  
kipp.singapore@kippzonen.com

### **Kipp & Zonen USA Inc.**

125 Wilbur Place  
Bohemia  
NY 11716  
United States of America

T: +1 631 589 2065  
F: +1 631 589 2068  
kipp.usa@kippzonen.com

Go to [www.kippzonen.com](http://www.kippzonen.com) for your local distributor or contact your local sales office.

